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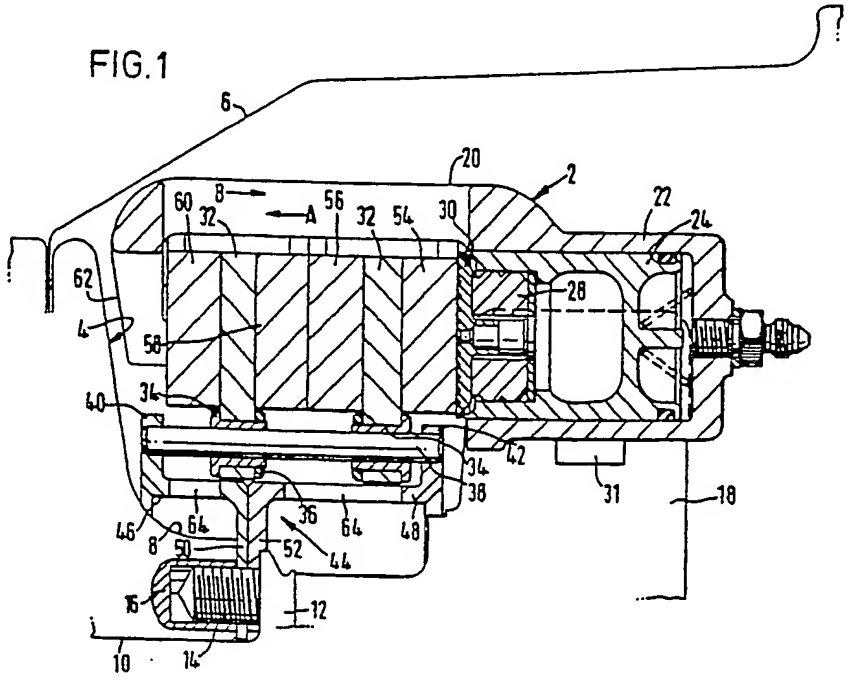
(54) Caliper disc brake

(57) The disc brake 2 has a caliper 20 holding brake pads 54, 56, 58 and 60 which clamp annular brake discs 32 by fluid pressure applied to piston 24. Back-to-back bells 46, 48 form a support 44 secured to a roadwheel hut 8 to rotate about axis X with the road wheel 4. The bells have annular radial flanges 40 and 42 supporting ends of substantially parallel shafts 38, the discs 32 being mounted to slide on the shafts 38. As shown there are eight cylindrical shafts 38 and bushes 34 of e.g. titanium are clamped to the discs 32 and mounted on the shaft 38. Piston 24 contains a plug of heat resistant material e.g. asbestos and acts on heat resistant plate 30 e.g. of titanium.

Holes 64 around bells 46, 48 allow generally radial cooling air flow.

In Figs. 2, 3 (not shown) shafts (138) are rectangular/substantially square received in notches (106) in inner perphery of discs (132).

FIG.1



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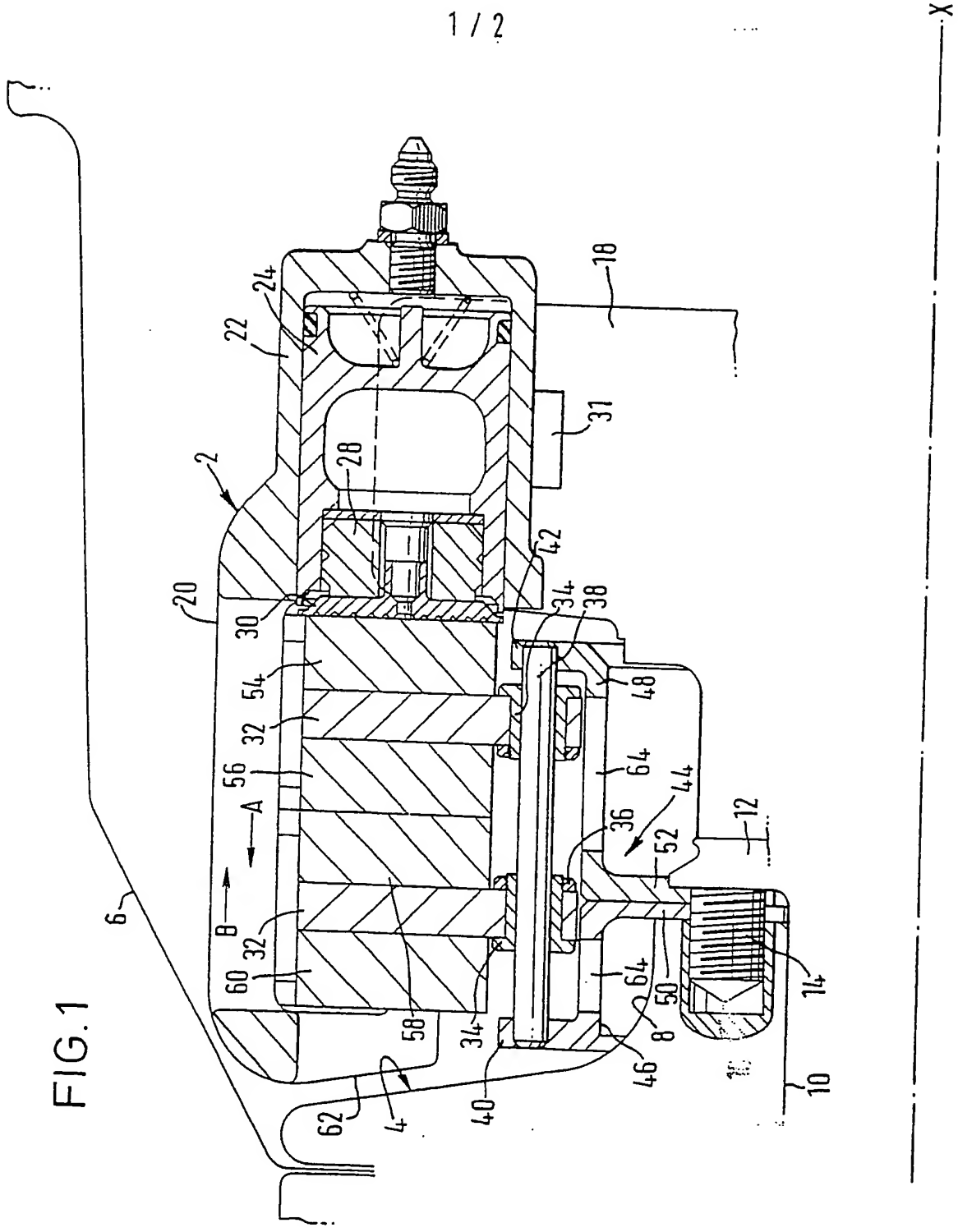
X
2
4
6
8
10
12
14
18
20
22
24
28
30
31
32
34
36
38
40
42
44
46
48
50
52
54
56
58
60
62
64
A
B

FIG.1

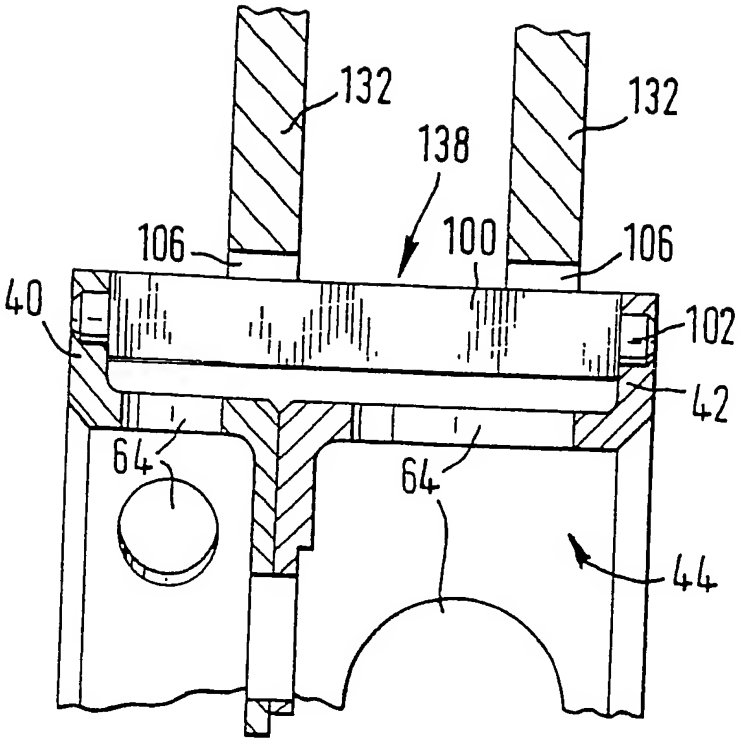
132
132
138
106
100
106
40
102
42
64
64
44

FIG. 2

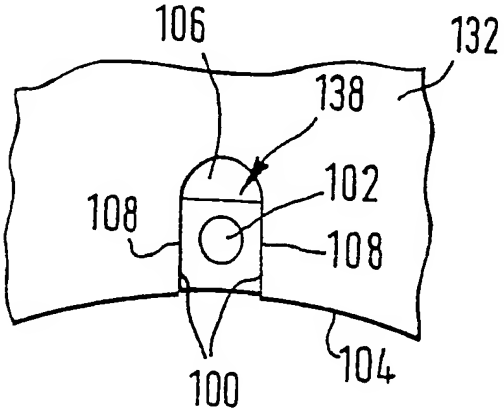
106
132
138
102
108
108
100
104

FIG. 3

SPECIFICATION

Caliper disc brake

This invention concerns a brake disc arrangement of a caliper disc brake for braking a rotating element by clamping the disc between brake pads.

The invention also concerns a caliper disc brake provided with the brake disc arrangement, which disc brake may be used, for example, on a motor vehicle to apply braking effort to a road wheel.

In a known caliper disc brake an annular brake disc of carbon has its inner periphery formed with carbon gear teeth which mate with grooves between splines formed axially on the outer surface of a shaft mounted fast with a vehicle road wheel to rotate the disc with the wheel about an axis coinciding with axis of rotation of the wheel. When pressure is applied to the brake to clamp brake pads (which may also be of carbon) against opposite sides of the disc, the disc can respond to the clamping pressure to move axially of the shaft along the splines to adjustably centre the disc between the pads. But the forming of said gear teeth and splines can be a relatively expensive procedure. Furthermore the grooves between the splines can become choked with carbon dust to an extent preventing the adjustable centring of the disc with the consequent risk of damage to the disc, besides which on brake release at least one of the pads may still be closely applied to the disc unable to move away from the pad so excessive pad and disc wear can result in addition to undesired retardation of the vehicle.

An object of the invention is to provide a brake disc arrangement capable of being formed in a manner which can avoid or at least mitigate the aforesaid disadvantages.

According to the invention there is provided a brake disc arrangement of a caliper disc brake for braking a rotating element by clamping the disc between brake pads the disc arrangement comprising a support mounted or adapted to be mounted fast with said element so that the support rotates with the element about an axis coinciding with the axis of rotation of the element, a plurality of spaced substantially parallel shafts mounted on said support to rotate with the latter and being disposed on the circumference of a circle substantially centred on said axis of rotation of the support, each shaft being supported by said support at spaced supporting positions at or adjacent to each end of the shaft, at least one annular brake disc substantially centred on the axis of rotation of the support, said disc being in engagement with the shaft for rotation thereby about the axis of rotation of the support, and said disc being slidable along the shafts.

caliper disc brake including the brake disc arrangement, that arrangement may comprise a plurality of said discs each mounted on shafts as aforesaid in the immediately preceding paragraph, in such a brake pads can be clamped against the opposite sides of each disc.

Preferably the shafts have smooth external sides and may be, for example, substantially cylindrical along at least those portions of their lengths co-operating with the disc(s).

Each shaft may be supported by a pair of flanges provided on the support and extending generally radially outwardly with respect to axis of rotation of the support, the two flanges being axially spaced apart.

The invention will now be further described, by way of example, with reference to the accompanying drawing in which:—

Figure 1 is a fragmentary view, partly in section, of a caliper disc brake provided with a brake disc arrangement formed according to the invention and mounted on a motor vehicle shown diagramatically;

Figure 2 is a fragment partly in section, of another embodiment of a brake disc arrangement formed according to the invention; and,

Figure 3 is a side view of a fragment of the arrangement in Fig. 2.

With reference to Fig. 1, the caliper disc brake 2 is mounted on a motor vehicle. The motor vehicle can be of any kind, though in this example it is represented by a high performance car, for example a racing car. The vehicle has a road wheel 4 (shown diagrammatically) with a rim 6 to receive a tyre (not shown) and a central hub 8 receiving a sleeve 10 having a fast annular collar 12 provided with a circular array of spaced, threaded studs 14 (only one shown) each receiving a respective nut 16 by which the sleeve is clamped to the hub. In the sleeve is an axle (not shown) on which the wheel rotates about axis X. This axle is mounted on the vehicle's suspension, in this example on a corner post 18.

The disc brake 2 has a caliper 20 formed with an integral cylinder 22 containing a brake actuating piston 24 operated by fluid pressure in known manner and containing a plug 28 of heat resistant material, for example asbestos, acting on a heat resistant plate 30 which may be of metal, for example titanium. The caliper is formed with lugs 31 by which it mounted on the post 18.

The brake comprises a pair of annular brake discs 32 of friction material, for example carbon/carbon, centred on the axis X. Adjacent to its inner periphery each disc 32 is formed with a circular array of equi-spaced holes each lined by a bush 34 may be of heat resistant metal, for example titanium, clamped to the disc by a screw threaded ring 36. Each bush is slidably mounted on a cylindrical shaft 38 which is

tially parallel shafts 38 substantially equispaced and disposed in a circular array centred on the axis X. At each end each shaft 38 is an interference fit in a radially outwardly extending annular supporting flange 40 or 42 on an annular support 44 which may be of metal, for example aluminium. The support 44 comprises a pair of bells 46 and 48 held back to back by the shafts 38 and having internal annular flanges 50, 52 appertured to receive the studs 14 used to clamp the support to the hub 8 so that the support rotates with the wheel about axis X and thus the shafts drive the brake discs about that axis.

In known manner the caliper 20 holds brake pads 54, 56 and 58 which can slide in directions A and B and a brake pad 60 braced by a side 62 of the caliper. The brake pads may be of carbon/carbon. In brake application, the piston 24 urging the plate 30 shoves the pads 54, 56 and 58 and the discs 32 in the direction A against the pad 60, thus clamping the discs between the pads.

Holes 64 formed around the annular bells allow the generally radial flow of cooling air through the support 44.

In the embodiment shown in Figs. 2 and 3 the shafts 38 (Fig. 1) are substituted by shafts 138 which can be of rectangular or, as shown, substantially square cross-section with opposite parallel sides 100 and having cylindrical end stub 102 fitted to the flanges 40 and 42 of the support 44. Each brake disc 132 which may be of metal, for example, cast iron has an inner periphery 104 at which notches 106 open. Each notch has opposite parallel sides 108 between which the sides 100 of a said shaft 138 are accommodated to drive the discs and allow the latter to slide axially of the shafts. In this embodiment the use of the shafts 138 and notches 106 allows for heat expansion of the discs. The brake pads used may be of conventional friction materials.

By supporting the shafts 38 and 138 at both ends, the shafts can be held substantially rigid, thereby avoiding or at least considerably reducing the chance of the shafts flexing. Thus the shafts 38 (or 138) can have a high probability of remaining straight and substantially parallel which facilitates sliding of the brake discs along the shafts. But by confining the supporting of each shaft 38 or 138 to both its ends leaves space along its length between the shaft and support 44 in which cooling air can flow to promote cooling of the support, shafts, brake discs and of the disc brake assembly.

CLAIMS

1. A brake disc arrangement of a caliper disc brake for braking a rotating element by clamping the disc between brake pads, the disc arrangement comprising a support [illegible] said element so that the support rotates with the element about an axis coinciding with the axis of rotation of the element, a plurality of spaced substantially parallel shafts mounted on said support to rotate with the latter and being disposed on the circumference of a circle substantially centred on said axis of rotation of the support, each shaft being supported by said support at spaced supporting positions at or adjacent to each end of the shaft, at least one annular brake disc substantially centred on the axis of rotation of the support, said disc being in engagement with the shafts for rotation thereby about the axis of rotation of the support, and said disc being slidable along the shafts.

2. A brake disc arrangement as claimed in Claim 1, in which there are a plurality of said discs each mounted on shafts as aforesaid in Claim 1.

3. A brake disc arrangement as claimed in Claim 1 or Claim 2, in which each shaft is supported by a pair of flanges provided on the support and extending generally radially outwardly with respect to the axis of rotation of the support, the two flanges being axially spaced apart.

4. A brake disc arrangement as claimed in any one preceding claim, in which the or each disc is engaged by said shafts passing through openings in the disc, which openings are disposed at or adjacent to an inner periphery of the disc.

5. A brake disc arrangement as claimed in Claim 4, in which said openings contain liners to slide on the shafts.

6. A brake disc arrangement as claimed in any one preceding claim, in which at least those portions of the shafts on which the disc or discs can slide have substantially cylindrical external shapes.

7. A brake disc arrangement as claimed in any one preceding claim, in which the or more than one of said discs is/are formed of carbon.

8. A brake disc arrangement as claimed in Claim 5, in which the openings are notches which open at the inner periphery of the or each disc.

9. A brake disc arrangement as claimed in Claim 8, in which each notch has a pair of substantially parallel opposite sides, and the shaft engaging said notch is equipped with a pair of substantially parallel surfaces each disposed in the notch and adjacent to a respective said side.

10. An annular brake disc arrangement as claimed in any one preceding claim, in which the support is formed with holes allowing flow therethrough of air generally radially of the axis of rotation of the support.

11. A brake disc arrangement of a caliper disc brake for braking a rotating element by clamping the disc between brake pads, said [illegible]

before described with reference to Fig. 1 or Figs. 2 and 3 of the accompanying drawings.

12. A caliper disc brake comprising a brake disc arrangement as claimed in any one preceding claim in combination with a caliper mounting brake pads disposed on each side of the or each disc, and means for applying brake pressure to cause the pads to grip the disc or discs between the pads.

13. A motor vehicle provided with a caliper disc brake as claimed in Claim 12, in which the rotating element is a road wheel with which the support is fast.

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